

The Knowledge Bank at The Ohio State University

Ohio State Engineer

Title: Selection of Motor Fuels

Creators: Arnold, Donald S.

Issue Date: 1940-06

Publisher: Ohio State University, College of Engineering

Citation: Ohio State Engineer, vol. 23, no. 7 (June, 1940), 14-16.

URI: <http://hdl.handle.net/1811/35725>

SELECTION OF MOTOR FUELS

—from a talk by Mr. C. D. Boehm of Ethyl Gasoline Corporation
to A. I. Ch. E.

By DONALD S. ARNOLD

The recent developments in automobile engines require more careful selection of fuels to obtain the proper performance and maximum efficiency. In the selection of a fuel one should consider the following specifications.

One of the fundamental properties of a gasoline is its volatility; for liquid gasoline will not burn, only the vapor burns. Gasoline, consisting of from two to three hundred different compounds (hydrocarbons), naturally has a wide range of boiling points—one for each hydrocarbon. This range extends from 100 to 400 degrees Fahrenheit.

A gasoline requires a sufficient quantity of the hydrocarbons with low boiling points to vaporize sufficiently to permit easy starting on a cold motor. It must also possess enough of the heavier compounds to provide the desired power source. It is these with the higher boiling points that provide the more power.

The vapor pressure must not be too great as it may, on hot days, force the gasoline back out of the fuel supply system. It was explained that on a summer day, as long as the car is in motion, the engine and carburetor are cooled by a steady stream of air. When the car is stopped, the heat from the motor is conducted through the manifold to the carburetor and supply lines. This heat causes the gasoline to vaporize and this in turn, since the carburetor outlet is closed when one stops the engine, exerts a back

pressure through the fuel lines. This pressure forces the gasoline out of the lines back into the tanks. Since the vapor mixture is "too lean" the engine will not start and the fuel pump cannot function when surrounded by this gaseous mixture. This condition is known as "vapor-lock" since the vapor locks the fuel supply system. The only remedy is to relieve the pressure by cooling the carburetor and lines. The proper vapor pressure, that exerted by a sample when raised to a temperature of 100 degrees Fahrenheit, is nine pounds per square inch in summer and eleven in winter.

A third consideration is that of gum content. The petroleum gum is formed by the oxidation of unstable hydrocarbons which were created in the "cracking" process. This gum presents a formation on the fuel lines and the tank very similar to varnish. When it dries, it is jarred off and pieces jams the carburetor. The maximum gum content permitted by this company is ten milligrams per hundred cubic centimeters. It was suggested that when the fuel supply system does get congested with gum it may be removed by splashing acetone around the tank and then running it through the supply lines and using it in the engine as fuel. It will perform the same as gasoline.

The sulfur content is another dangerous factor in the modern engines. When the gasoline burns in the cylinder, sulfur dioxide and water are formed. These

Successful

ENGINEERS

ARE SLAVES TO DETAILS

The Student Engineer does well to pattern after the great men who have gone before him. Attention to minute details are their constant aim to gain perfection.

The Carroll Press, Inc. has shown a steady growth in the engineering of the printed message. They too, owe their success to the principle of "Attention to Details."

Phone Un. 4185

CARROLL PRESS, INC.

PRINTERS

32 WARREN STREET



PUBLISHERS

COLUMBUS, OHIO

in turn unite to form hot H_2SO_3 , sulfurous acid, which, if in sufficient quantities, will etch the polished surfaces with which it comes in contact (valve seats, bearings, and cylinder walls). A sulfur content of less than one tenth of one percent is safe.

The fifth specification, an indication of the power present in the gasoline, is the octane rating. An increase in the octane rating increases power and decreases motor knock. The higher octane rated gasolines are better due to a more even burning rather than a partial burning followed by spontaneous detonation of the remainder. It is the meeting of the pressures exerted by these two combustions that produces the engine knock.

A new camera that takes 5000 exposures per second has been developed for the study of gasoline burning in the cylinder by the General Motors Research Laboratory. It photographs this action taking place in a cylinder head covered by a heavy quartz plate permitting observation of the combustion. It was this method that determined the above facts of premature combustion producing cylinder knock.

The octane rating system was explained as being a comparison with mixtures of iso-octane (considered to have a rating of 100) and normal heptane (considered to have a rating of zero). The gasoline of unknown rating and the mixture of octane and heptane suspected of matching the unknown are tried in a special motor. It has a connection such that an instantaneous switch can be made from the standard to the unknown. When the percentage of octane in the standard mixture is adjusted so that the performance in the motor is the same as that of the unknown the determination is complete. The percentage of octane in the mixture prevailing during the test must also be taken into unknown gasoline.

A young bride walked into a drug store and timidly approached the clerk. "The baby tonic you advertise," she began, "does it really make babies bigger and stronger?"

"We sell a lot of it," replied the clerk, "and we've never had a complaint."

"Well I'll take a bottle. She paid for it and went out. Five minutes later she was back. She got the clerk into a corner and whispered into his ear.

"I forgot to ask you about this baby tonic," she whispered. "Who takes it—me or my husband?"—Wayne Engr.

Minister: "My lad, do you know what happens to little boys that use that bad language when they break their toys?"

Little Boy: "Yes, sir; they grow up and study engineering."

When considering the octane rating of a gasoline, it is essential that one know the system on which the rating was derived. There are the "CFR", "L-3", and "1939 Research" systems. The differences lie in a slight variation in the motors used in making the test. The effect of the atmospheric conditions prevailing during the test must also be taken into account. At the present time, the American Society Testing Materials has a committee working on the "1939 Research" method and it is hoped that soon they will present a report that will be adopted and thereby set a single system for all ratings. Until that time there will still be three slightly different systems.

Today there are three gasolines on the market. There is the light, cheap variety which has a low rating. The medium variety is a mixture of cracked gasoline, straight run from the refinery, and gasoline treated with lead tetraethyl. This one tests about seventy-three. The premium gasoline has an octane rating of about eighty. The owners of the new model automobiles are the ones who are using this high test variety.

The aviation industry recognizes five grades of fuel with octane ratings of seventy-three to ninety-five, most of them falling between eighty-three and ninety-two.

The importance of having the timing mechanism advanced for obtaining full benefit of the high rating gasoline was stressed. It was stated that many garagemen hesitate to do so in fear of producing an engine knock and thus losing respect of the patron. Never the less, it is quite important that the "spark be set up" in order to get the proper performance from the modern engines and fuels. He also pointed out that the benefits of using the premium fuels in old cars is not nearly so great as that realized in the new ones.

Pat's left eye was badly discolored. His wife asked who did it. "Mike Murphy," he sadly replied.

"What," she exclaimed, "do you mean that you let a little shrimp like that black your eye?"

"Martha," said Pat, holding up his hand reproachfully, "don't spake disrespectfully of the dead."

R.O.T.C. Special

Student: "Captain, I have neither pencil nor paper."

Captain: "What would you think of a soldier who went to battle without ammunition?"

Student: "I would think he was an officer, sir."

There are three classes of coeds—the intellectual, the beautiful, and the majority.

It is all right to tell a girl that she has pretty ankles but don't compliment her too highly.—Minn. Techno Log.

*It's the Busiest
Book in the world!*



...because it's helpful to millions

The familiar Telephone Directory is America's No. 1 Reference Book—consulted millions of times a day by men, women and children in every walk of life.

Besides being "America's Calling List," it is also one of the most helpful buying guides. In the classified "Where to Buy It" section (*yellow pages*) you will find the

names, addresses, and telephone numbers of dealers who sell what you want—many of them listed under the trade marks of scores of nationally advertised brands.

The idea behind the classified section is one of many pioneered by the Bell System to increase the value of your telephone service.

Why not telephone home often? Rates to most points are lowest any night after 7 P. M. and all day Sunday.

